

REMARKS

Applicant respectfully requests reconsideration. Claims 1, 17, 23, and 24 were previously pending in this application. Claim 17 has been amended to depend from claim 1 and it is requested that claim 17 now be examined (with reference to Applicants' response filed May 19, 2005 electing claims 1, 17, 23, and 24). Claims 1, 17, 23, and 24 are pending for examination with claim 1 being an independent claim. No new matter has been added.

In all instances herein where reference to the specification of the instant application is made, references is made to the corresponding published PCT application (International Patent Publication WO 00/02090); copy enclosed.

Rejection of Claims 1, 23, and 24 under 35 U.S.C. §112, First Paragraph

Claims 1, 23, and 24 were rejected under 35 U.S.C. §112, first paragraph, on the grounds that the specification is not enabling. Specifically, the Patent Office asserts that undue experimentation would be required to formulate suitable compositions for claim 1 or to determine what would or would not infringe claim 1. Applicants respectfully traverse the rejection.

The Examiner asserts that the composition of the polymeric article is critical or essential to the practice of the invention, and that claim 1, in the absence of composition, is too broad and in excess of provided enablement in the specification.

An enablement rejection based on the grounds that a disclosed critical limitation is missing from a claim should be made only when the language of the specification makes it clear that the limitation is critical for the invention to function as intended. MPEP 2164.08(c). In the present application, the specific composition of the polymeric article is not a critical or essential limitation. The specification states that no single, particular polymeric species is critical for use in the present invention. In fact, a variety of polymeric species may be used in accordance with the invention so long as other criteria described in the specification are met (page 16, line 29 – page 16, line 32; page 27, lines 10-15). For example, any polymeric article containing an inorganic species that is capable of forming a ceramic oxide and that is present in an amount of at least about 3 atomic% based on

the total number of atoms in the first domain of the polymeric article may be used in the present invention so long as other criteria recited in claim 1 are met.

In addition, applicants respectfully submit that the Examiner has not met the required burden for making a rejection for non-enablement. The Patent Office must consider not just a single factor, but a totality of the circumstances involving many factors when making a determination that the application is not enabled. *In re Wands*, 858 F.2d 731, 737, 8 USPQ2d 1400, 1404 (Fed. Cir. 1988). Referring to *Wands* for a discussion of these factors, it is noted that they include (1) the breadth of the claims, (2) the nature of the invention, (3) the state of the prior art, (4) the level of one of ordinary skill in the art, (5) the level of predictability of the art, (6) the amount of direction provided, (7) the existence of working examples, and (8) the quantity of experimentation needed. As outlined in various PTO materials regarding enablement of chemical/biotechnical applications, it is improper to conclude that a disclosure is not enabling without careful review of all of these factors. Applicants submit that an analysis of the *Wands* factors weighs in favor of Applicants' assertion of enablement over the full scope of the claims, as discussed in detail below.

Breadth of the Claims

The breadth of the claims is reasonable in view of the teaching in the specification, as described further below in view of the other *Wands* factors. The Patent Office asserts that claim 1 purports to cover any conceivable combination of ingredients either presently existing or which might be discovered in the future and which would impart desired characteristics but are unobvious to the instantly claimed invention. It is noted that the claims are not so broad as to encompass any combination of ingredients imparting certain desired characteristics. Instead, the claims include significant structural recitation. The claimed system must be polymeric, a 3-dimensionally periodic structure of a plurality of periodically occurring separate domains, first and second domains (at least) each being topologically continuous, with the first domain comprising a polymeric species containing an inorganic species having certain capabilities and present in a certain atomic percent. This is significant structural/compositional recitation. Regarding the inorganic species recited, such inorganic species are well known to those of ordinary skill in the art, as discussed more fully below. Also, while claim 1 covers a variety of materials and is not limited to one, specific composition, the

specification provides clear teaching and guidance as to select and synthesize appropriate materials within this range, as described below.

The Nature of the Invention

The nature of the invention is a polymeric article having certain structural periodicity and topological continuity, at least one domain including an inorganic species, at a particular amount, able to form a ceramic oxide. As to the “inorganic species capable of forming a ceramic oxide”, which is the subject of this rejection, inorganic species having this capability are well known. Those of ordinary skill in the art, in context with the remainder of the claim and the specification, would easily be able to select, without undue experimentation, suitable inorganic species.

The State of the Prior Art

The state of the prior art is advanced. Inorganic species which are capable of forming ceramic oxides upon oxidation are well-known to those of ordinary skill in the art, as described in the specification and in references of record in this application (see specific notations to specification, below). Further, the design and synthesis of a wide variety of polymeric articles including three-dimensionally periodic structures of a plurality of periodically occurring separate domains with at least a first and a second domain each being topologically continuous is very clearly aided by much detailed study in the art, as described in the specification and in references of record in this application.

The Level of Ordinary Skill in the Art

The level of ordinary skill in the art is high. The relevant arts are polymer chemistry, materials science, and inorganic chemistry. The skilled artisan is familiar generally with the design and synthesis of a wide variety of polymers, including polymers containing inorganic species capable of forming ceramic oxides, as illustrated by the references cited in the specification and of record in the application.

The Level of Predictability of the Art

With respect to inorganic species which are capable of forming ceramic oxides as part of a polymeric article (which is the main point of contention of the Patent Office), the predictability of

the art is reasonably high. For example, it is well known that polymeric species containing inorganic species such as Si, Ge, Sn, B, Ti, Fe, or Al are capable of forming ceramic oxides upon oxidation, as illustrated by the specification (page 15, lines 4-12; page 15, line 32 – page 16, line 14) and references cited in the specification and of record in the application (see also, “Amount of Direction Provided,” below).

The Amount of Direction Provided

The amount of direction provided by Applicants in the specification is substantial. Applicants provide, in the working examples and in the specification, techniques that are applicable to the selection and synthesis of polymeric articles comprising inorganic species for use in the present invention. For example, the selection of polymeric species containing inorganic species that are capable of forming ceramic oxides upon oxidation is described in the specification (page 15, lines 4-12; page 15, line 32 – page 16, line 14) and in numerous references cited in the specification and of record in the application.

The specification also provides screening tests for the selection of appropriate polymeric species (page 25, line 31 – page 27, line 9), as well as guidance for selecting and obtaining suitable first and second blocks, molecular weights, and other characteristics of the polymeric species of the invention (page 20, line 32 – page 22, line 2). The specification further teaches methods for selecting the appropriate domain dimensions or periodic lengths of different domains or blocks within the polymeric species (page 25, lines 4-23).

The Existence of Working Examples

Applicants have provided ten working examples and two prophetic examples demonstrating synthesis of the claimed system using the teachings in the specification. The methods described in the examples are not only applicable to the specific polymeric compositions described, but many of these methods may be applied to synthesize a variety of polymeric species containing inorganic species capable of forming ceramic oxides, or precursors thereof, without any level of undue experimentation. For example, the examples teach the synthesis of monomers and polymers containing inorganic species capable of forming ceramic oxides, which those of ordinary skill in the art would be able to modify using routine experimentation (Examples 1 and 2). The preparation and

characterization of three-dimensionally, periodically structured polymeric articles (Example 3) and methods for their conversion to porous, periodically structured ceramic articles (Examples 5, 6, 9, and 10) are also described and may be modified by those of ordinary skill in the art with routine experimentation.

The Quantity of Experimentation Needed

The amount of experimentation required to practice within the scope of the claims that stand rejected on this ground, in view of the totality of teachings of the specification of this application and the state of the art, is routine experimentation. Inorganic species which are capable of forming ceramic oxides, in general, are well known, and one of ordinary skill in the art can determine which inorganic species would be suitable for use in the present invention without undue experimentation. Screening for such compounds, if not quickly identified in other ways, would be routine. A survey of the prior art (references included in the specification and in the accompanying Information Disclosure Statement) provides evidence of the fact that such ceramic-forming species in general are known to those skilled in the art.

Therefore, a full and fair analysis of the *Wands* factors strongly suggests that the Applicants have enabled the claimed invention throughout its full scope.

Examiner has also raised the issue of the alleged difficulty of determining infringement, which is not relevant to enablement. The Examiner's reliance on *Ex parte Slob* is misplaced, as *Ex parte Slob* is only relevant with respect to invalidity under 35 U.S.C. §112, second paragraph.

Accordingly, withdrawal of the rejection under 35 U.S.C. §112, first paragraph, is respectfully requested.

Rejection of Claims 1, 23, and 24 under 35 U.S.C. §112, Second Paragraph

Claims 1, 23, and 24 were rejected under 35 U.S.C. §112, second paragraph, as being indefinite. The Patent Office asserts that the recitation "an inorganic species capable of forming a ceramic oxide, said inorganic species present in an amount of at least about 3 atomic% based on the total number of atoms in the first domain" is vague, indefinite, functional, and fails to give notice as to what constitutes infringement upon the instantly claimed invention. Specifically, the Office Action states that claim 1 merely sets forth physical characteristics in the polymeric article rather

than a specific structure and/or compositions. On this basis, the Patent Office asserts that the scope of claim 1 is indefinite. Applicants respectfully traverse the rejection.

Applicants note that what is required under 35 U.S.C. §112, second paragraph, is that those skilled in the art understand what is being claimed, when the claims are read in light of the specification. Orthokinetics v. Safety Travel Chairs, Inc., 806 F.2d 1565, 1 USPQ 2d 1081 (Fed. Cir. 1986). In the present case, the plain meaning of the above-recited, objected to claim language is believed to be perfectly understandable to those of ordinary skill in the art.

The rejection is misguided in stating that claim 1 merely sets forth physical characteristics without structure and/or composition. Indeed composition is set forth. "An inorganic species capable of forming a ceramic oxide" is an inorganic species having a certain inherent characteristic, and clauses such as this have been found to be definite in many, many issued U.S. patent claims. This is not simply a physical characteristic desired in an article, as would be the case if the clause simply recited a desired Young's modulus or impact strength of the polymer (although characteristic-centered recitations such as those have also been found definite in many, many issued patent claims). The above-quoted language of claim 1 clearly indicates that any inorganic species capable of forming a ceramic oxide, along with other recitations within the claim which have not been specifically pointed out in this particular rejection, is intended to and does fall within the scope of the claim. This recitation, when read in light of Applicants' specification and figures, would be clearly understood by those of ordinary skill in the art.

It appears that the Patent Office's basis for objection to the above-recited claim language may be it believes that the claim 1 reads broader than certain specific, exemplary compositions in Applicants' specification. However, claim breadth is not an appropriate basis for a rejection under 35 U.S.C. §112, second paragraph, so long as those of ordinary skill in the art would understand the scope of the claim in view of the specification. MPEP §2173.04; In re Miller, 441 F.2d 689 (CCPA 1971). If the scope of the subject matter embraced by the claims is clear, as in the present case as explained above, and if the Applicants have not otherwise indicated that they intend the invention to be of a scope different from that defined in the claims, then the claims comply with 35 U.S.C. §112, second paragraph.

Relevant to this rejection as well as the enablement rejection above, Applicants also point out that the law does not require that claims be limited by the specific compositions or examples mentioned in Applicants' specification, so long as the claims are properly enabled by the specification. Claims can be, and typically are, broad enough to cover at least some embodiments not specifically exemplified in the specification. In the present case, Applicants' recitation of "an inorganic species capable of forming a ceramic oxide, said inorganic species present in an amount of at least about 3 atomic% based on the total number of atoms in the first domain" is intended to cover, but not be strictly limited to, the specific examples of inorganic species mentioned in Applicant's specification. Indeed, "[t]o demand that the first to disclose shall limit his claims to what he has found will work or to materials which meet the guidelines specified for 'preferred' materials in a process... would not serve the constitutional purpose of promoting progress in the useful arts." In re Goff 542 F.2d 564, 567 (CCPA 1976).

The Patent Office also asserts that the above-quoted language of claim 1 is functional and, thus, renders the claim indefinite. Applicants disagree. "Capable of forming a ceramic oxide" is an inherent, physical/chemical characteristic of a material. Regardless, there is nothing inherently wrong with defining some part of an invention in functional terms. Functional language does not, in and of itself, render a claim improper. MPEP §2173.05(g); In re Swinehart, 439 F.2d 210 (CCPA 1971). It has been held that functional limitations that set definite boundaries on the patent protection being sought are perfectly acceptable. MPEP §2173.05(g); In re Barr, 444 F.2d 588 (CCPA 1971).

The Examiner has also raised the issue of alleged difficulty in determining infringement. While the ability to determine infringement is not the test for indefiniteness, as described above, Applicant argues that it would be straightforward for one of ordinary skill in the art to determine which materials would infringe claim 1 based on the limitations recited in the claim.

Applicants believe that claim 1 is clear and understandable to those of ordinary skill in the art and, therefore, is in full compliance with 35 U.S.C. §112, second paragraph. Claims 23 and 24 depend from claim 1, and, therefore, are also in full compliance with 35 U.S.C. §112, second paragraph.

Accordingly, withdrawal of the rejection of claims 1, 23, and 24 is respectfully requested.

Rejection of Claims 1, 23, and 24 under 35 U.S.C. §102(b), or in the alternative, under 35 U.S.C. §103(a)

Claims 1, 23, and 24 have been rejected under 35 U.S.C. §102(b) as being anticipated by, or, alternatively, under 35 U.S.C. §103(a) as being obvious over, Lee et. al., *Macromolecules* **1989**, 22, 2602-2606 ("Lee"). Applicants respectfully traverse the rejection.

Claim 1 recites a system comprising a polymeric article including a three-dimensionally periodic structure of a plurality of periodically occurring separate domains, with at least a first and a second domain each being topologically continuous, and with said first domain comprising a polymeric species containing an inorganic species capable of forming a ceramic oxide, said inorganic species present in an amount of at least about 3 atomic% based on the total number of atoms in the first domain, as recited in claim 1. A topologically continuous (or bicontinuous) structure is continuous in the sense that a particular domain in a periodic, polymeric structure forms a continuous pathway through the structure (page 13, line 32 – page 14, line 2 of the specification).

In contrast, Lee teaches porous membranes from block copolymers having lamellar, cylindrical, and spherical domains, which are discrete structures. In discrete structures, domains are physically isolated from, and not in physical contact with, other like domains in the structure (page 14, lines 8-10 of the specification). The topologically continuous structure in the present invention as defined by claim 1 is distinct in view of discrete structures, in that a self-supporting, three-dimensional, periodic, porous membrane can be produced.

The Patent Office also asserts that the materials in Lee contain 2.86 atomic% of silicon, which Patent Office contends is "about 3 atomic%," as recited in claim 1 of the present invention. Applicants do not necessarily agree with this assertion, but comment on this point is not necessary in view of the clear distinction of the recitation of claim 1 in view of Lee as set forth in the preceding paragraph. Accordingly, claim 1 is not anticipated by Lee.

To the extent the instant rejection relies on 35 U.S.C. §103, one advantage that can be realized by the present invention, and not by Lee, is noted. Embodiments of the present invention

involve an oxidation step to crosslink the inorganic species in the first domain to form a ceramic oxide and to remove (or etch) the second domain. Systems of the present invention have a sufficient amount of silicon (e.g., at least about 3 atomic%) in the first domain such that, upon oxidation of the inorganic species to form a ceramic oxide, a separate crosslinking reaction to stabilize the ceramic oxide against the oxidation is not needed. In contrast, the materials in Lee require a separate crosslinking reaction via treatment with HCl to crosslink and stabilize the system against the oxidation.

Moreover, Applicant sees no suggestion or motivation in Lee, or elsewhere in the prior art, to modify the teachings of Lee to obtain a system that includes the afore-mentioned claim limitations. Because each claim limitation is not taught or suggested by Lee and there is no motivation to modify the teachings of Lee to obtain the recited system, independent claim 1 is patentable over Lee.

Claims 23 and 24 depend from claim 1 and are, therefore, also patentable over the Lee for at least this reason.

Accordingly, withdrawal of the claim rejections on these grounds is respectfully requested.

In view of the above amendment, applicant believes the pending application is in condition for allowance.

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Respectfully submitted,

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